

Amendments to the Drawings:

The attached drawing sheet(s) include(s) changes to Figure 1. This sheet, which includes Figure 1 replaces the original sheet.

REMARKS

Applicants respectfully request reconsideration of this Application, as amended.

In accordance with the Examiner's recommendation, attached hereto is a replacement sheet that includes Figure 1 which has been designated as "Prior Art." Withdrawal of the objection to the drawings is respectfully requested.

Claim 5 has also been amended in accordance with the Examiner's recommendation. Withdrawal of the objection to Claim 5 is also therefore respectfully requested.

Regarding the rejection of the claims in view of Cioffi and Shi, Applicants respectfully submit the claims are patentably distinguishable from the cited references.

Specifically, Claims 1, 7, 13, and 15 include the general feature of estimating the equivalent TDR length based on an optimization. As discussed at least in paragraphs 83 and 92 of Applicants' specification, the optimization includes finding a time shift between the measured far-end echo and a theoretical far-end echo of the end loop in accordance with an optimization process.

While the Office Action concedes that Cioffi "does not disclose an optimized TDR means to determine disclosed estimated loop length," the Office Action relies on Shi paragraph 24 and the Abstract. However, neither the Abstract, nor paragraph 24, which are both reproduced below for the Examiners convenience, have any teaching, suggestion or disclosure of an optimization process. Moreover, there is no teaching, suggestion or disclosure of the updating or utilizing steps as claimed. At best, Shi discloses the ability to "calibrate out its own characteristics, providing high precision SELT measurements of the impedance, and a frequency domain reflectometry, and time domain reflectometry." Contrary to the assertions in the Office Action, "high precision" measurements are not an optimization.

A central office modem (50) that includes the capability of single-ended loop testing (SELT) is disclosed. The modem (50) includes a digital signal processor (54), a codec (56), line driver and receiver circuitry (58), and a hybrid circuit (60), by way of which a subscriber loop (LOOP) can be driven and sensed. The line driver and receiver circuitry (58) may include a transformer (74a, 74b) for driving the loop (LOOP), or the output may be capacitively coupled. The line driver and receiver circuitry (58) includes active termination, by way of operational amplifiers (80a, 80b). Switches (82a, 82b; 84a, 84b) are provided to selectively enable and disable the active termination function, and to selectively bypass or include the hybrid circuit (60). This control of the line driver and receiver circuitry (58) provides the ability to calibrate out its own characteristics, providing high precision SELT measurements of the load impedance type, and of frequency domain reflectometry, and time domain reflectometry. A third set of switches (86a, 86b) selectively bypass receive path filter circuitry (78), to permit upstream and downstream noise measurements. (Abstract of Shi)

[0024] In this equation, the voltages $V_{\text{sub}0\text{sup}+}$ and $V_{\text{sub}0\text{sup}-}$ are the nominal voltage amplitudes of the forward-going and reflected signals from the reflection location, respectively. Impedance $Z_{\text{sub}0}$ is the characteristic impedance of the transmission line, while impedance $Z_{\text{sub}1}$ is the mismatched impedance. Propagation constant $\gamma = \alpha + \beta i$ characterizes the transmission, and loop length D is the distance to the mismatch location. Following this expression, the short loop case ($Z_{\text{sub}1}=0$) has a reflection coefficient ρ of -1, and the open loop case (with $Z_{\text{sub}1}$ infinite) has a reflection coefficient ρ of +1. In general, the voltage and current at any point of the loop is the superposition of the forward and backward traveling voltage and current waveforms:

$$V(x) = V_{\text{sub}0\text{sup}+} + e^{\gamma x} \cdot \gamma \cdot \alpha + V_{\text{sub}0\text{sup}-} - e^{\gamma x} \cdot \gamma \cdot \alpha. \quad (5a)$$

$$I(x) = I_{\text{sub}0\text{sup}+} + e^{\gamma x} \cdot \gamma \cdot \alpha + I_{\text{sub}0\text{sup}-} - e^{\gamma x} \cdot \gamma \cdot \alpha. \quad (5b)$$

(Paragraph 24 of Shi)

Regarding Claims 2, 4, 8, 10, 12, 13, 14, 16 and 18, the Office Action asserts that the device "inherently" detects a time shift between a theoretical echo and received echo because the system correlates the received echo delayed to a loop length, with reference to Shi paragraph 24. This assertion is not supported by the teachings of Shi. As can be seen in the above quotation of Shi, there is nothing in paragraph 24 that teaches, suggests or disclose detecting a time shift between a theoretical echo and a received echo as asserted.

Similar arguments can be made for Claims 6, 12, 14 and 19, in that contrary to the Office Action's assertions, there is no teaching, suggestion or disclosure of estimating a physical loop length based on an equivalent TDR loop length and a time shift between a measured echo and an echo from an equivalent loop.

Applicants would like to point out that to establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *In re Robertson*, 169 F.3d 743, 745, 49 U.S.P.Q. 2D 1949, 1950-51 (Fed. Cir. 1999). Therefore, should the Examiner continue to wish to rely on the rationale in the Office Action, Applicants respectfully request the Examiner provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristics necessarily flow from the teachings of the applied art.

Based on the above, and the lack of any teaching, suggestion or disclosure of the combination of features as recited in the independent claims, Applicants respectfully submit the independent claims are clearly patentably distinguishable from the references of record. The

claims that depend therefrom are further distinguishable based at least on the above and the additional feature(s) recited therein.

Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

The Commissioner is hereby authorized to charge to deposit account number 19-1970 any fees under 37 CFR § 1.16 and 1.17 that may be required by this paper and to credit any overpayment to that Account. If any extension of time is required in connection with the filing of this paper and has not been separately requested, such extension is hereby Petitioned.

Respectfully submitted,

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